

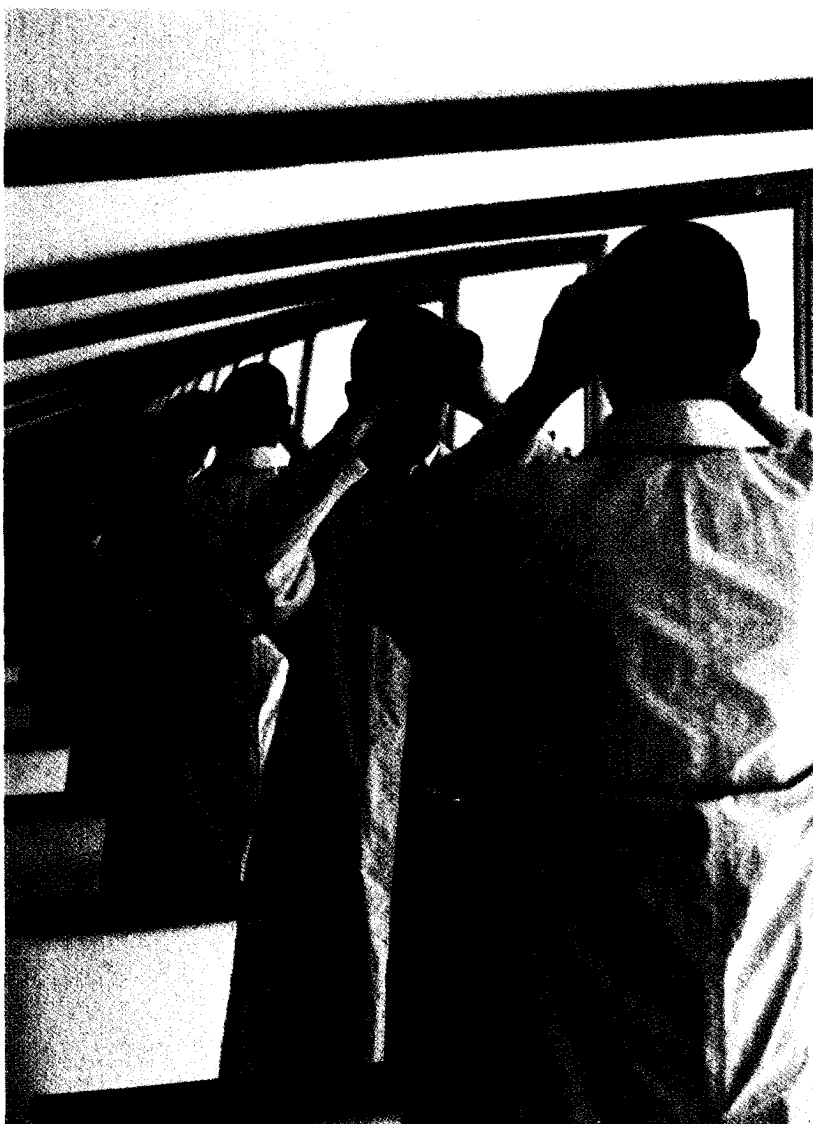
The Past and Future of Competitive Advantage

Today's competitive advantage may become tomorrow's albatross unless strategists attune themselves to changes in underlying conditions.

Clayton M. Christensen

Competitive advantage is a concept that often inspires in strategists a form of idol worship — a desire to imitate the strategies that make the most successful companies successful. It is interesting, however, that strategists have viewed precisely *opposite* factors to be sources of competitive advantage at different points in the histories of a number of industries. For example, Henry Ford's emphasis on focus has been touted right next to General Motors' product-line breadth as the key to success. Today, the outsourcing flexibility inherent in the nonintegrated business models of Cisco Systems and Dell Computer is held up as a model for all to emulate, whereas a generation ago IBM's vertical integration was widely considered an unassailable source of competitive advantage. In the 1980s, power-tool maker Black & Decker aggressively consolidated its diffused international-manufacturing infrastructure into a few global-scale facilities so that it could counter the aggressive market-share gains that Makita had logged by serving the world market from a single plant in Japan. At that very time, Makita was moving aggressively toward manufacturing in smaller-scale local facilities around the world.

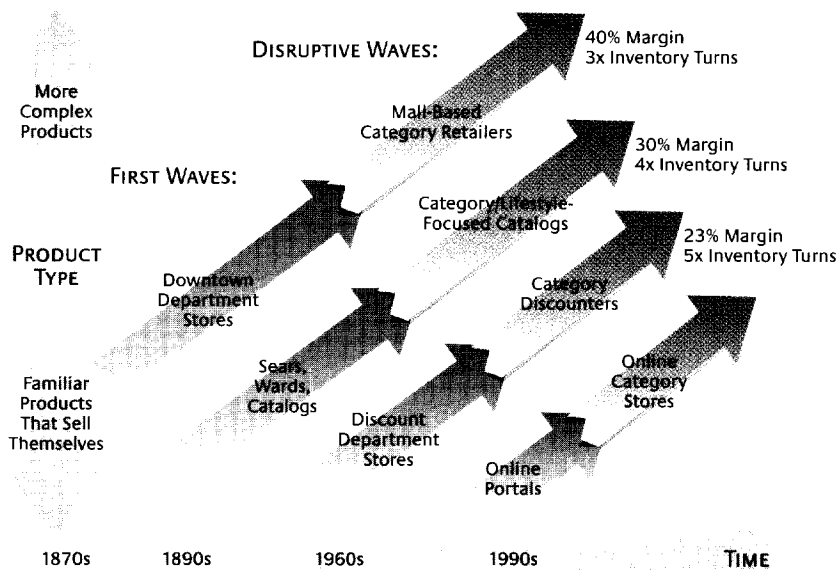
Indeed, strategists whose anecdotal understanding of com-



petitive advantage runs only as deep as "If it's good for Cisco, it must be good for everybody" at best are likely to succeed in building yesterday's competitive advantages. If history is any guide, the practices and business models that constitute advantages for today's most successful companies confer those advantages only because of particular factors at work under particular conditions at this particular time.

Historically, several factors have conferred powerful

Historical Disruptions in Retailing



advantages on the companies that possessed them — economies of scale and scope, integration and nonintegration, and process-based core competencies. What are the circumstances that cause each factor to be a competitive advantage? How and why do competitive actions erode the underpinnings of those advantages? Strategists need to peel away the veneer of *what* works, and understand more deeply *why* and under *what conditions* certain practices lead to advantage. In so doing, they might begin to predict successfully which of today's powerful competitive advantages are likely to erode and what might cause new sources of advantage to emerge in the future. (Many of the insights presented here are rooted in work on disruptive innovation presented in my 1997 book "The Innovator's Dilemma: When New Technologies Cause Great Firms To Fail.")

Economies of Scale

In the 1960s and 1970s, concepts of competitive advantage often were predicated upon steep scale economics, and many tools of strategic analysis were built upon those economics (for example, growth-share matrices, experience curves and industry-supply curves). Indeed, scale allowed successful companies such as General Motors and IBM to enjoy lower costs than their competitors. IBM, with 70% market share, earned 95% of the main-frame-computer industry's profits; General Motors, with 55% market share, earned 80% of the automobile industry's profits. Today steep scale economics explain the profits and dominant market shares of companies such as Intel, Boeing and Microsoft.

Steep economies of scale exist when there are high fixed vs. variable costs in the predominant business model. Large organi-

zations can amortize the fixed costs over greater volumes, condemning small competitors to playing the game on an adversely sloped playing field.

However, Toyota taught the Western world that many fixed costs aren't ordained by nature but are artifacts of specific technological and managerial solutions to problems. By reducing in-process inventories, setup times for machinery, and the overhead costs inherent in an inventory-intensive batch-manufacturing process, Toyota flattened the scale economics of assembling a car. CAD (computer-aided-design) systems had a similar effect on reducing the fixed, upfront cost of designing a new model. As a result, there is now no relationship between an auto producer's market share and its profitability. Analogous innovations have flattened scale economics in steel, electric-power generation and computers — and rendered transitory what were

once thought to be sustainable advantages.

Strategists in industries that today see leading companies enjoying scale-based competitive advantage ought to ask themselves if the fundamental trade-offs that create today's high fixed costs might change — leveling the playing field in even more situations. Consider Intel. A barrier to potential competitors is the \$700 million cost to design a new family of microprocessors and the \$3 billion needed to build a new fabrication facility. However, disruptive technologies such as Tensilica's modular microprocessor architecture are flattening the scale economics of design. And small fabrication facilities, or minifabs, could reduce the fixed costs of production. Such technologies take root at the low end of the market first, but they are marching relentlessly up the performance spectrum.

In the pharmaceutical industry, megamergers have created \$100 billion behemoths. The logic behind those mergers has been that the huge fixed costs and extraordinary uncertainty associated with clinical trials for new drugs confer ever greater advantages on ever larger companies. Historically, that has indeed been the case. But could something change the underpinnings of those high fixed costs?

Understanding of the human genome will flatten the scale economics in clinical trials. For example, we now understand that there are at least six distinctly different diseases that were once thought to be one disease — leukemia. Each of the six is associated with a specific, unique treatment protocol, and each can be precisely diagnosed through a characteristic pattern among about 50 genes. We now realize that in the past, most of the patients in a clinical trial for a new leukemia treatment didn't

have the specific disease being studied. Compounds worked for some patients and not for others; and to determine clinical efficacy with satisfactory statistical results, large numbers of patients needed to be enrolled for long clinical trials. That created huge, front-end fixed costs and steepened the scale economics.

Now, however, a technician can draw a blood sample and compare the pattern in the patient's genes with a template and diagnose specifically which leukemia is present. In the future, 100% of the patients in a clinical trial will have the specific disease being studied, and smaller, faster trials will achieve clearer clinical outcomes. Scale will no longer confer superior profits upon larger companies; it will be an albatross. Today's merging companies are moving exactly in the wrong direction at exactly the wrong time because their strategists (and investment bankers) have not thought deeply about cause and effect in competitive advantage.

Economies of Scope

A second source of competitive advantage, intertwined with scale economics, has been product-line breadth. For example, through the 1970s, Caterpillar's scope gave the company an unassailable advantage in construction equipment against smaller competitors such as Komatsu. Only Caterpillar was large enough to absorb the complexity-driven overhead costs of developing, manufacturing and distributing a full product line. Caterpillar's dealers did not need to carry equipment from other manufacturers in order to offer customers whatever they needed. Caterpillar's huge installed base of equipment in the field meant its dealers, who were the largest dealers in each market, could afford to stock the parts necessary to offer 24-hour delivery of any spare part to any Caterpillar owner. No competitor could match that — until the underpinnings of the trade-offs inherent in the advantages changed.

Caterpillar's economies of scope had pinned Komatsu into a niche position, until Toyota's methods for reducing fixed costs in design and assembly came to construction equipment. That allowed Komatsu to produce a broader range of products in its existing plants without a ballooning of changeover, scheduling, inventory, expediting costs and quality costs that historically had plagued less focused factories. Furthermore, the advent of overnight air-delivery services meant that local dealers did not need to stock a complete inventory of spare parts in order to equal Caterpillar's service. Such factors leveled the playing field.

Retailing is an industry in which competitive advantages have waxed and waned. (See "Historical Disruptions in Retailing.") In fact, four waves of disruptive technology have swept through the industry. In the first wave were downtown department stores such as Marshall Field's, which came to prominence in the early

1870s. The second wave consisted of mail-order catalogs such as Sears, Roebuck in the 1890s. In the early 1960s, the third disruptive wave broke, and discount department stores such as Kmart and Wal-Mart emerged. Online retailing is the latest wave.

Two patterns have recurred in these waves. First, the disruptive retailers survived on much lower gross margins than the established retailers and earned acceptable returns by turning inventories faster. At the outset, because their salespeople had less product expertise than salespeople in the prior wave, the disruptive retailers could sell only simple products that were familiar in use, such as hardware, paint and kitchen utensils. In each instance, the retailers subsequently migrated upmarket toward more complex, nonstandard products, such as clothing and home furnishings.

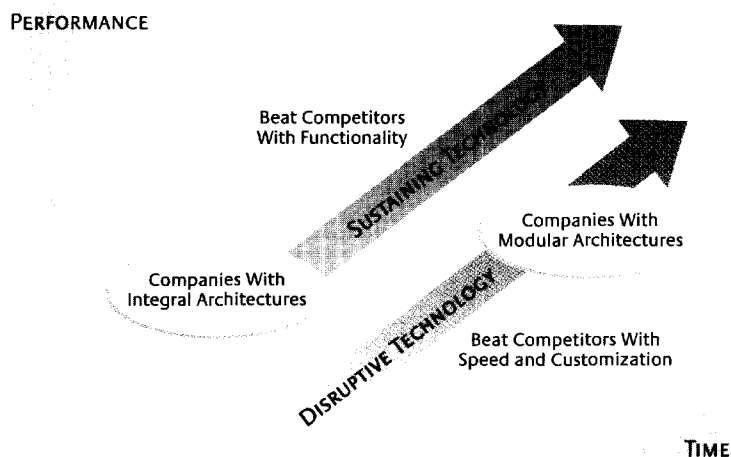
A second pattern was that in each instance, the dominant disrupters at the outset were broad-line department stores, or portals, whose scope conferred powerful competitive advantages. Marshall Field's, for example, was the portal of the 1870s. Before Marshall Field's, consumers didn't know where to go to get what they needed. But people walking through the new portal realized that what they wanted was probably in there somewhere. The Sears catalog served as a portal to rural Americans. Discount department stores also were portals, selling a little bit of everything. In each of the prior waves of disruption, however, the portals were preempted by retailers focusing on a product category or a lifestyle. Focused retailers had a similar financial model (measured by typical margins and inventory turns), but their focus simplified the shopping experience and enabled a deeper product line and better service. Hence, mall-based retailers such as Banana Republic and Williams-Sonoma have largely preempted department stores. Specialized catalogs such as L.L. Bean have preempted full-line catalogs. Focused discounters such as Circuit City, Toys "R" Us, Home Depot and Staples are supplanting discount department stores. When customers learn where to go to get what they need, the portals' competitive advantage of scope becomes a disadvantage.

Online retailing appears to be following the same pattern. Portal envy afflicts many venture capitalists and dot-com entrepreneurs because the most valuable real estate on the Internet has been claimed by America Online, Yahoo! and Amazon.com. Nevertheless, history may prove the portals' current advantages transitory.

Vertical Integration and Nonintegration as a Competitive Advantage

It was not that long ago that the ability to do everything internally at IBM, General Motors, Standard Oil, Alcoa and AT&T was viewed as a powerful competitive advantage. Now the tables

What Determines Competitive Advantage?



seem to have turned, and vertical integration seems to slow companies down. Cisco and other nonintegrated companies, which outsource much of their manufacturing and product development to partners or startup companies they subsequently acquire, have the model that is the envy of today's corporate strategists. But what are the circumstances that confer advantage upon integrated and nonintegrated companies, and what could cause those circumstances to change?

Every product or service is produced in a chain of value-added activities. To be successful at outsourcing a piece of that chain to a supplier, a company must meet three conditions. First, it must be able to specify what attributes it needs. Second, the technology to measure those attributes must be reliably and conveniently accessible, so that both the company and the supplier can verify that what is being provided is what is needed. And third, if there is any variation in what the supplier delivers, the company needs to know what else in the system must be adjusted. The company needs to understand how the supplier's contribution will interact with other elements of the system so that the company can take what it procures and plug it into the value chain with predictable effect. If those three conditions are met, then it is possible to outsource a value-added activity.

Markets work when there is adequate information — and the three classes above constitute the information that is necessary and sufficient for markets to emerge between stages of value-added activity. But what about the innumerable situations in which market-enabling information does *not* exist — for example, when truly new technologies emerge? IBM's development of magnetoresistive (MR) disk-drive recording heads in the early 1990s is

such an example. MR heads can increase a disk drive's data-storage capacity by a factor of 10 — and yet achieving that increase is not an easy feat. A drive maker cannot simply outsource the heads and plug them into a product that was designed using conventional algorithms. The design of the disks, the actuator mechanisms, the error-correction software and dozens of other aspects of the product need to be interactively modified as the MR heads are incorporated. MR technology is not yet understood well enough for engineers to specify to suppliers which attributes are most critical. Technology to measure those attributes is not well developed, and engineers can't predict accurately how variability in the properties of a head might affect the performance of the system. Nor do they understand how changes in product design might affect manufacturability or how subtle changes in manufacturing methods might affect product performance.

Manufacturing therefore *must* be done in-house. When necessary and sufficient information doesn't exist at critical interfaces, integration is imperative.

In general, vertical integration is an advantage when a company is competing for the business of customers whose needs have not yet been satisfied by the functionality of available products. Integrated companies are able to design interactively each of the major subsystems of a product or service, efficiently extracting the most performance possible out of the available technology. (See "What Determines Competitive Advantage?")

When the prevailing functionality of products has overshot what customers can utilize, however, then the way companies compete must change. Making even better products no longer yields superior profits. Instead, innovations that enhance a company's abilities to bring products rapidly to market — and responsively and conveniently to customize offerings — become the mechanisms for achieving advantage. When the basis of competition evolves thus, then modular, industry-standard interfaces among the major subsystems of a product become defined, enabling nonintegrated, focused companies to emerge and provide specific pieces of value-added activity. Focused companies can operate on much lower overhead costs, and standard interfaces enable product designers and assemblers to mix and match components to tailor features and functions to the needs of specific customers. Hence, in tiers of a market in which customers are overserved by the functionality of available products, nonintegration is an advantage: A population of nonintegrated companies that interface through market mechanisms is faster and more flexible than an integrated company.

(Supporting data appear in a Harvard Business School working paper the author and M. Verlinden wrote last year, "Disruption, Dis-Integration and the Dissipation of Differentiability.")

The opposite extremes of the computer industry illustrate the advantages of each structure. Machines that push the bleeding edge of performance, such as mission-critical servers, often combine nonstandard components designed and manufactured within integrated companies such as Hewlett-Packard. Machines not targeted at the frontiers of performance can be made more effectively in a nonintegrated model such as Dell's.

Cisco, which exploited the modular architecture of its routers to disrupt the telecommunications switching business from the low end, established in the minds of many the standard for a New Economy company. Cisco has efficiently outsourced much of its manufacturing to suppliers in its network and much of its new-product development to the startups it acquires. However, as Cisco has moved up into the most performance-demanding tiers of its markets — particularly optical networks — it is being forced to integrate, performing many more product-design and manufacturing activities internally than was necessary when it competed at greater distances from the bleeding edge. Cisco's competitors, such as Corning, JDS Uniphase, Nortel Networks and Lucent Technologies, also are finding that they have to become more integrated — *less* outsourced — in order to compete.

Hence, if customer needs go beyond the current technology, vertical integration constitutes a competitive advantage. If the technology is well established, integration is an albatross. Today's strategists must strive to understand the circumstances in which a company and its business model compete and whether the model puts the company at a competitive advantage or disadvantage.

Core Competence and Competitive Advantage

Some types of competitive advantage, such as those associated with the economics of scale and scope, are rooted in market positions. Others are rooted in business models; still others in the processes or competencies of organizations. Although the value of market positions and the relevance of business models can wax and wane, "tacit" competencies — internal processes — have been thought to be more enduring because they are harder to copy. Nevertheless, it turns out that competence residing in proprietary processes is also built upon temporary underpinnings.

DuPont, for example, enjoyed years of unparalleled capability to formulate new organic compounds. Its scientists did their work through collaborative trial and error. A scientist would mix and heat things in a beaker, draw a fiber out and then consult with colleagues who had expertise in various dimensions of organic chemistry about what the material might do, and how it could be improved. Over time, however, DuPont's strength,

which had resided in the patterns of interaction and collaboration among its scientists, came to be embodied in quantum theory. Now that the science of how atoms combine in molecular structures to create materials with particular properties is well defined, success is open to all. Any company can specify the properties needed in a material and then use theory-based algorithms to determine which atoms need to bond with which atoms in which patterns.

Similarly, a company such as BMW might say that its competitive advantage resides in its internal processes for designing unique automobiles. Indeed, there has been a "BMW-ness" to its designs that other companies' processes have not successfully replicated. The process of designing a new automobile is fixed-cost intensive and historically has entailed extensive interaction and collaboration among large groups of engineers. However, in order to reduce costs and improve its ability to design safe automobiles, BMW recently has created a system that enables its engineers to use computer simulations to crash-test the cars they design — before physical models are built. The simulations enable BMW's engineers to observe the crashes carefully and to improve designs — a wonderful system. But a capability that formerly resided in the interaction among the company's engineers is now embodied in algorithms — which not only flatten the scale economics associated with product design, but could make BMW's core competence more broadly available. In general, scientific progress that results in deeper, more fundamental understanding transforms into explicit, codified and replicable knowledge many things that once were accomplished only through proprietary problem-solving routines.

Every competitive advantage is predicated upon a particular set of conditions that exist at a particular point in time for particular reasons. Many of history's seemingly unassailable advantages have proved transitory because the underlying factors changed. The very existence of competitive advantage sets in motion creative innovations that, as competitors strive to level the playing field, cause the advantage to dissipate. That does not mean the search for competitive advantage is futile. Rather, it suggests that successful strategists need to cultivate a deep understanding of the processes of competition and progress and of the factors that undergird each advantage. Only thus will they be able to see when old advantages are poised to disappear and how new advantages can be built in their stead.

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